Understand and Configure Nexus 9000 vPC with Best Practices

Contents

Introduction

This document describes the best practices to use for virtual Port Channels (vPC) on Cisco Nexus 9000 (9k) Series Switches.

Prerequisites

Requirements

- NX-OS License Requirement for vPC
- vPC feature is included in the base NX-OS software license.

Hot Standby Router Protocol (HSRP), Virtual Router Redundancy Protocol (VRRP), Link Aggregation Control Protocol (LACP) are also included in this base license.

Layer 3 features like Open Shortest Path First (OSPF) protocol or Intermediate-System-to-Intermediate System (ISIS) protocol require LAN_ENTERPRISE_SERVICES_PKG license.

Components Used

The information in this document is based on these software and hardware versions:

- Cisco Nexus93180YC-FX that runs Release 10.2(3)
- Cisco Nexus93180YC-FX that runs Release 10.2(3)

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Terms	Meaning
vPC	The combined port-channel between the vPC peers and the downstream device. A vPC is a L2 port type: switchport mode trunk or switchport mode access.
vPC peer device	A vPC switch (one of a Cisco Nexus 9000 Series pair).
vPC Domain	Domain containing the 2 peer devices. Only 2 peer devices max can be part of the same vPC domain.
vPC Member port	One of a set of ports (that is. Port-channels) that form a vPC (or port-channel member of a vPC).
vPC Peer-link	Link used to synchronize the state between vPC peer devices. It must be a 10-Gigabit Ethernet Link. vPC peer-link is a L2 trunk carrying vPC VLAN.
vPC Peer-keepalive link	The keepalive link between vPC peer devices; this link is used to monitor the liveness of the peer device.
vPC VLAN	VLAN carried over the peer-link.

vPC Fabric Peering provides an enhanced dual-homing access solution without the overhead of waste physical ports for vPC Peer Link.

Background Information

This document applies to:

- Nexus 9k vPC

- vPC with Vxlan
- vPC Fabric Peering
- Double-Sided vPC
- Double-Sided virtual vPC

This document also covers In-Service Software Upgrade (ISSU) operations related to vPC and gives details about the latest vPC enhancements (delay restore, Network Virtual Interface (NVE) interface timers).

vPC Description and Terminology

vPC is a virtualization technology that presents both Cisco Nexus 9000 Series paired devices as a unique Layer 2 logical node to access layer devices or endpoints.

vPC belongs to Multichassis EtherChannel (MCEC) family of technology. A virtual port channel (vPC) allows links that are physically connected to two different Cisco Nexus 9000 Series devices to appear as a single port channel to a third device.

The third device can be a switch, server, or any other networking device that supports link aggregation technology.

vPC Technical Benefits

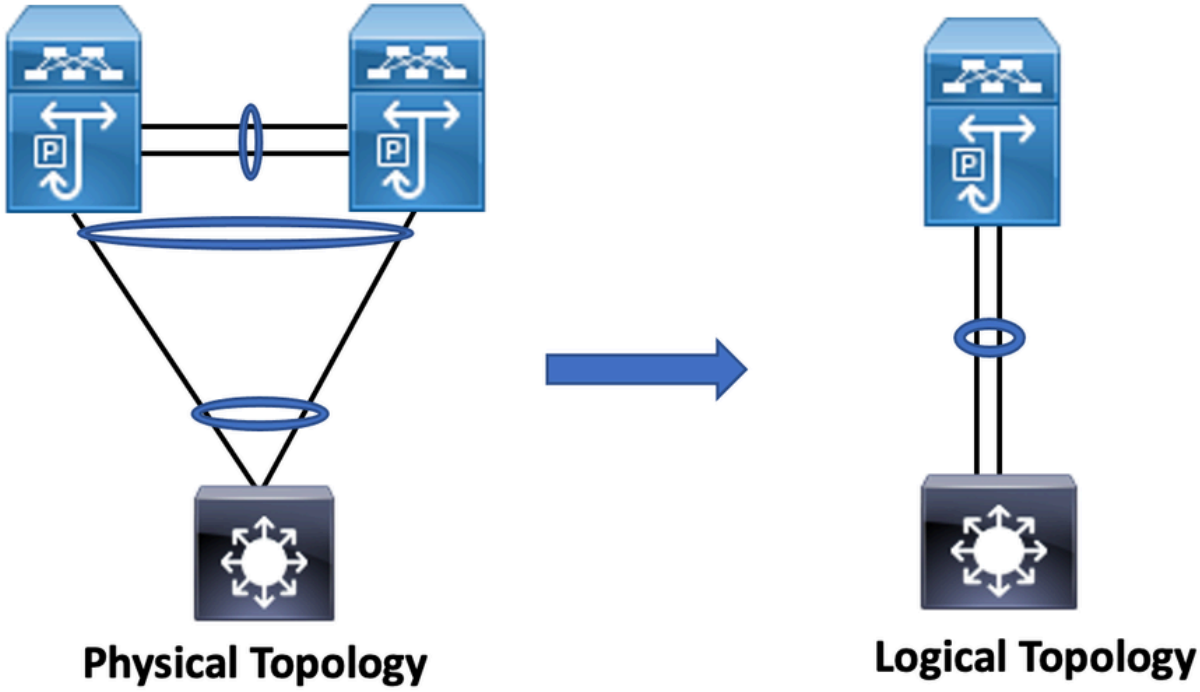
vPC provides these technical benefits:

- Eliminates Spanning Tree Protocol (STP) blocked ports.
- Uses all available uplink bandwidth.
- Allows dual-homed servers to operate in active-active mode.
- Provides fast convergence upon link or device failure.
- Offers dual active/active default gateways for servers vPC. Also leverages native split horizon/loop management provided by port-channeling technology: a packet comes a port-channel cannot immediately exit that same port-channel.

vPC Operational and Architectural Advantages

vPC offers these immediate operational and architectural advantages for users:

- Simplifies network design.
- Builds highly resilient and robust Layer 2 network.
- Enables seamless virtual machine mobility and server high-availability clusters.
- Scales available Layer 2 bandwidth, increased bisectional bandwith.
- Grows the size of the Layer 2 network.



vPC Hardware and Software Redundancy Aspects

vPC leverages both hardware and software redundancy aspects through these methods:

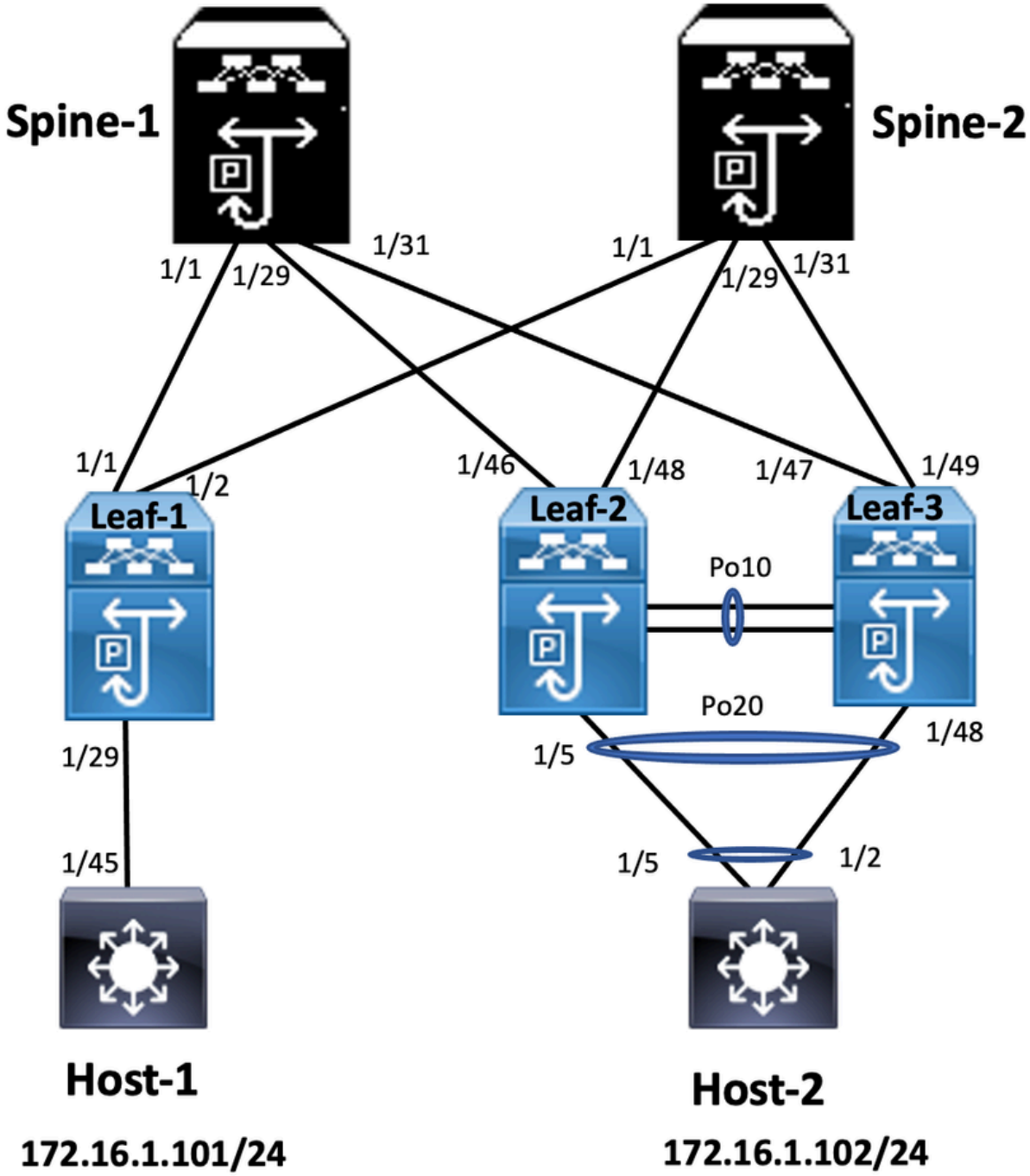
- vPC uses all port-channel member links available so that in case an individual link fails, hash algorithm redirects all flows to the available links.
- vPC domain is composed of two peer devices. Each peer device processes half of the traffic comes from the access layer. In case a peer device fails, the other peer device absorbs all the traffic with minimal convergence time impact.
- Each peer device in the vPC domain runs its own control plane, and both devices work independently. Any potential control plane issues stay local to the peer device and does not propagate or impact the other peer device.

From STP, vPC eliminates STP blocked ports and uses all available uplink bandwidth. STP is used as a fail safe mechanism and does not dictate L2 path for vPC-attached devices.

Within a vPC domain, a user can connect access devices in multiple ways: vPC-attached connections that leverage active/active behavior with port-channel, active/standby connectivity include STP, and single attachment without STP that runs on the access device.

Configure vPC EVPN VXLAN

Network Diagram



In the diagram, host connects to a pair of Nexus 9000 switches includes vPC domain id, but host-configured switches do not run vPC themselves. The access switch/host registers uplink as a simple port-channel without vPC knowledge.

<#root>

Leaf-1

```
vlan 2
vn-segment 10002
vlan 10
vn-segment 10010
```

```
route-map PERMIT-ALL permit 10
vrf context test
vni 10002
rd auto
address-family ipv4 unicast
route-target both auto
route-target both auto evpn

interface nve1
no shutdown
host-reachability protocol bgp
source-interface loopback1
member vni 10002 associate-vrf
member vni 10010
suppress-arp
mcast-group 239.1.1.1

interface loopback0
ip address 10.1.1.1/32
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
no shutdown

interface loopback1
ip address 10.2.1.1/32
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
no shutdown
```

Leaf-2

```
vlan 2
vn-segment 10002
vlan 10
vn-segment 10010
route-map PERMIT-ALL permit 10
vrf context test
vni 10002
rd auto
address-family ipv4 unicast
route-target both auto
route-target both auto evpn

interface nve1
no shutdown
host-reachability protocol bgp
advertise virtual-rmac
source-interface loopback1
member vni 10002
associate-vrf member
vni 10010
suppress-arp
mcast-group 239.1.1.1

interface loopback1
ip address 10.2.1.4/32
ip address 10.2.1.10/32 secondary
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
icam monitor scale
```

```
interface loopback0
ip address 10.1.1.4/32
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
no shutdown

Leaf-2(config-if)# show run vpc
feature vpc

vpc domain 1
peer-switch
peer-keepalive destination 10.201.182.26 source 10.201.182.25
peer-gateway
ip arp synchronize

interface port-channel10
vpc peer-link

interface port-channel20
vpc 20
```

Leaf-3

```
vlan 2
vn-segment 10002
vlan 10
vn-segment 10010
route-map PERMIT-ALL permit 10
vrf context test
vni 10002
rd auto
address-family ipv4 unicast
route-target both auto
route-target both auto evpn

interface nve1
no shutdown
host-reachability protocol bgp
advertise virtual-rmac
source-interface loopback1
member vni 10002
associate-vrf member
vni 10010
suppress-arp
mcast-group 239.1.1.1

interface loopback1
ip address 10.2.1.3/32
ip address 10.2.1.10/32 secondary
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
icam monitor scale

interface loopback0
ip address 10.1.1.3/32
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode

Leaf-3(config-if)# show run vpc
feature vpc
```

```
vpc domain 1
peer-switch
peer-keepalive destination 10.201.182.25 source 10.201.182.26
peer-gateway
ip arp synchronize

interface port-channel10
vpc peer-link

interface port-channel20
vpc 20
```

Spine-1

```
interface loopback0
ip address 10.3.1.1/32
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
```

Host-1

```
interface Vlan10
no shutdown
vrf member test
ip address 172.16.1.101/25
```

Host-2

```
interface Vlan10
no shutdown
vrf member test
ip address 172.16.1.102/25
```

Verify

Use this section to confirm that your configuration works properly.

```
ip interface Status for VRF "test"(3)

Interface ip Address Interface Status
Vlan10 172.16.1.102 protocol-up/link-up/admin-
up
HOST-B(config)# ping 172.16.1.101 vrf test
PING 172.16.1.101 (172.16.1.101): 56 data bytes
64 bytes from 172.16.1.101: icmp_seq=0 ttl=254
time=1.326 ms
64 bytes from 172.16.1.101: icmp_seq=1 ttl=254
time=0.54 ms
64 bytes from 172.16.1.101: icmp_seq=2 ttl=254
time=0.502 ms
64 bytes from 172.16.1.101: icmp_seq=3 ttl=254
```

```
IP Interface Status for VRF "test"(3)

interface IP Address Interface Status
Vlan10 172.16.1.101 protocol-up/link-up/admin-
up
Host-A(config-if)#
Host-A(config-if)# ping 172.16.1.102 vrf test
PING 172.16.1.102 (172.16.1.102): 56 data bytes
64 bytes from 172.16.1.102: icmp_seq=0 ttl=254
time=1.069 ms
64 bytes from 172.16.1.102: icmp_seq=1 ttl=254
time=0.648 ms
64 bytes from 172.16.1.102: icmp_seq=2 ttl=254
time=0.588 ms
```

```
time=0.533 ms
64 bytes from 172.16.1.101: icmp_seq=4 ttl=254
time=0.47 ms
--- 172.16.1.101 ping statistics ---
5 packets transmitted, 5 packets received,
0.00% packet loss round-trip min/avg/max =
0.47/0.674/1.326 ms HOST-B(config)#
```

```
64 bytes from 172.16.1.102: icmp_seq=3 ttl=254
time=0.521 ms
64 bytes from 172.16.1.102: icmp_seq=4 ttl=254
time=0.495 ms
--- 172.16.1.102 ping statistics ---
5 packets transmitted, 5 packets received,
0.00% packet loss round-trip min/avg/max =
0.495/0.664/1.069 ms Host-A(config-if)#
```

Troubleshoot

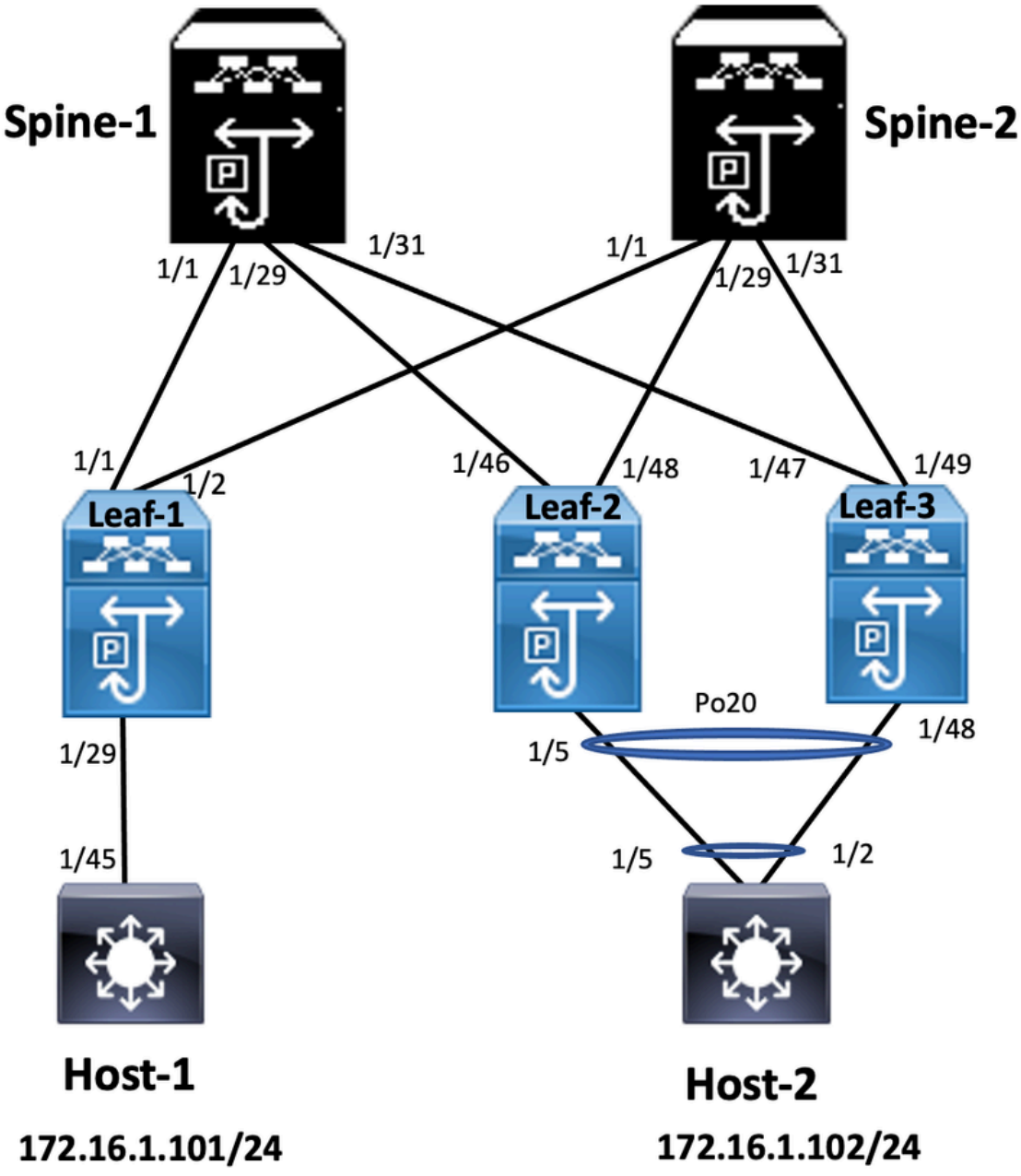
This section provides information you can use to troubleshoot your configuration.

```
Leaf-2(config-if)# show vpc bri
Legend:
(*) - local vPC is down, forwarding via vPC
peer-link
vPC domain id : 1
Peer status : peer adjacency formed ok
vPC keep-alive status : peer is alive
Configuration consistency status : success
Per-vlan consistency status : success
Type-2 consistency status : success
vPC role : primary
Number of vPCs configured : 1
Peer Gateway : Enabled
Dual-active excluded VLANs : -
Graceful Consistency Check : Enabled
Auto-recovery status : Disabled
Delay-restore status : Timer is off.(timeout =
30s)
Delay-restore SVI status : Timer is
off.(timeout = 10s)
Delay-restore Orphan-port status : Timer is
off.(timeout = 0s)
Operational Layer3 Peer-router : Disabled
Virtual-peerlink mode : Disabled
vPC Peer-link status
---------------------------------
id Port Status Active vlans
-- ---- ------ --------------------------------
-----------------
1 Po10 up 1-2,10

vPC status
----------------------------------------------
-----------------------------
Id Port Status Consistency Reason Active vlans
---------------
20 Po20 up success success 1-2,10
Please check "show vpc consistency-parameters
vpc <vpc-num>" for the consistency reason of
down vpc and for type-2 consistency reasons for
any vpc.
```

```
Leaf-3(config-if)# show vpc bri
Legend:
(*) - local vPC is down, forwarding via vPC
peer-link
vPC domain id : 1
Peer status : peer adjacency formed ok
vPC keep-alive status : peer is alive
Configuration consistency status : success
Per-vlan consistency status : success
Type-2 consistency status : success
vPC role : secondary
Number of vPCs configured : 1
Peer Gateway : Enabled
Dual-active excluded VLANs :
Graceful Consistency Check : Enabled
Auto-recovery status : Disabled
Delay-restore status : Timer is off.(timeout =
30s)
Delay-restore SVI status : Timer is
off.(timeout = 10s)
Delay-restore Orphan-port status : Timer is
off.(timeout = 0s)
Operational Layer3 Peer-router : Disabled
Virtual-peerlink mode : Disabled
vPC Peer-link status
---------------------------------
id Port Status Active vlans
-- ---- ------ --------------------------------
-----------------
1 Po10 up 1-2,10

vPC status
----------------------------------------------
-----------------------------
Id Port Status Consistency Reason Active vlans
---------------
20 Po20 up success success 1-2,10

Please check "show vpc consistency-parameters
vpc <vpc-num>" for the consistency reason of
down vpc and for type-2 consistency reasons for
any vpc.
```

Configure vPC Fabric Peering

Network Diagram



<#root>

Leaf-2

```
Leaf-2(config-vpc-domain)# show run vpc
feature vpc

vpc domain 1
peer-switch
peer-keepalive destination 10.201.182.26
virtual peer-link destination 10.1.1.3 source 10.1.1.4 dscp 56
peer-gateway
ip arp synchronize
```

```
interface port-channel10
vpc peer-link

interface Ethernet1/46
mtu 9216
port-type fabric
ip address 192.168.2.1/24
ip ospf network point-to-point
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
no shutdown
```

Leaf-3

```
Leaf-3(config-vpc-domain)# show run vpc
feature vpc

vpc domain 1
peer-switch
peer-keepalive destination 10.201.182.25
virtual peer-link destination 10.1.1.4 source 10.1.1.3 dscp 56

peer-gateway
ip arp synchronize

interface port-channel10
vpc peer-link

interface Ethernet1/47
mtu 9216
port-type fabric
ip address 192.168.1.1/24
ip ospf network point-to-point
ip router ospf 100 area 0.0.0.0
ip pim sparse-mode
no shutdown
```

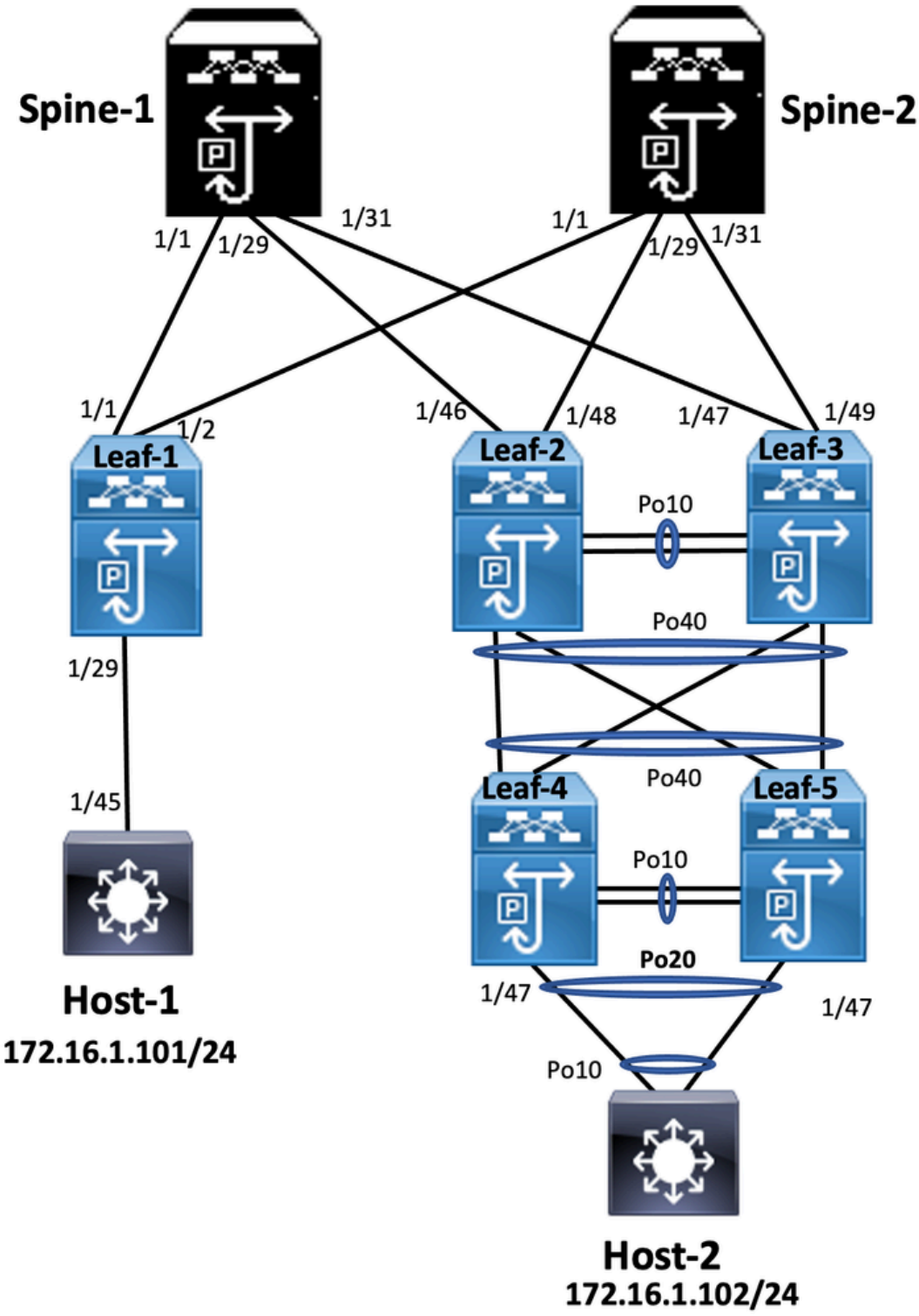
Verify

Use this section in order to confirm that your configuration works properly.

```
show vpc brief
show vpc role
show vpc virtual-peerlink vlan consistency
show vpc fabric-ports
show vpc consistency-para global
show nve interface nve 1 detail
```

Configure Double-Sided vPC

Network Diagram



<#root>

Leaf-2

```
Leaf-2(config-if-range)# show run vpc
feature vpc

vpc domain 1
peer-switch
peer-keepalive destination 10.201.182.26 source 10.201.182.25
peer-gateway
ip arp synchronize
```

```
interface port-channel10
  vpc peer-link

interface port-channel20
  vpc 20

interface port-channel40
  vpc 40
```

Leaf-3

```
Leaf-3(config-if-range)# show run vpc
feature vpc

vpc domain 1
peer-switch
peer-keepalive destination 10.201.182.25 source 10.201.182.26
peer-gateway
ip arp synchronize

interface port-channel10
  vpc peer-link

interface port-channel20
  vpc 20

interface port-channel40
  vpc 40
```

Leaf-4

```
Leaf-4(config-if)# show run vpc
feature vpc

vpc domain 2
  peer-keepalive destination 10.201.182.29 source 10.201.182.28
  peer-gateway

interface port-channel10
  vpc peer-link

interface port-channel20
  vpc 20

interface port-channel40
  vpc 40
```

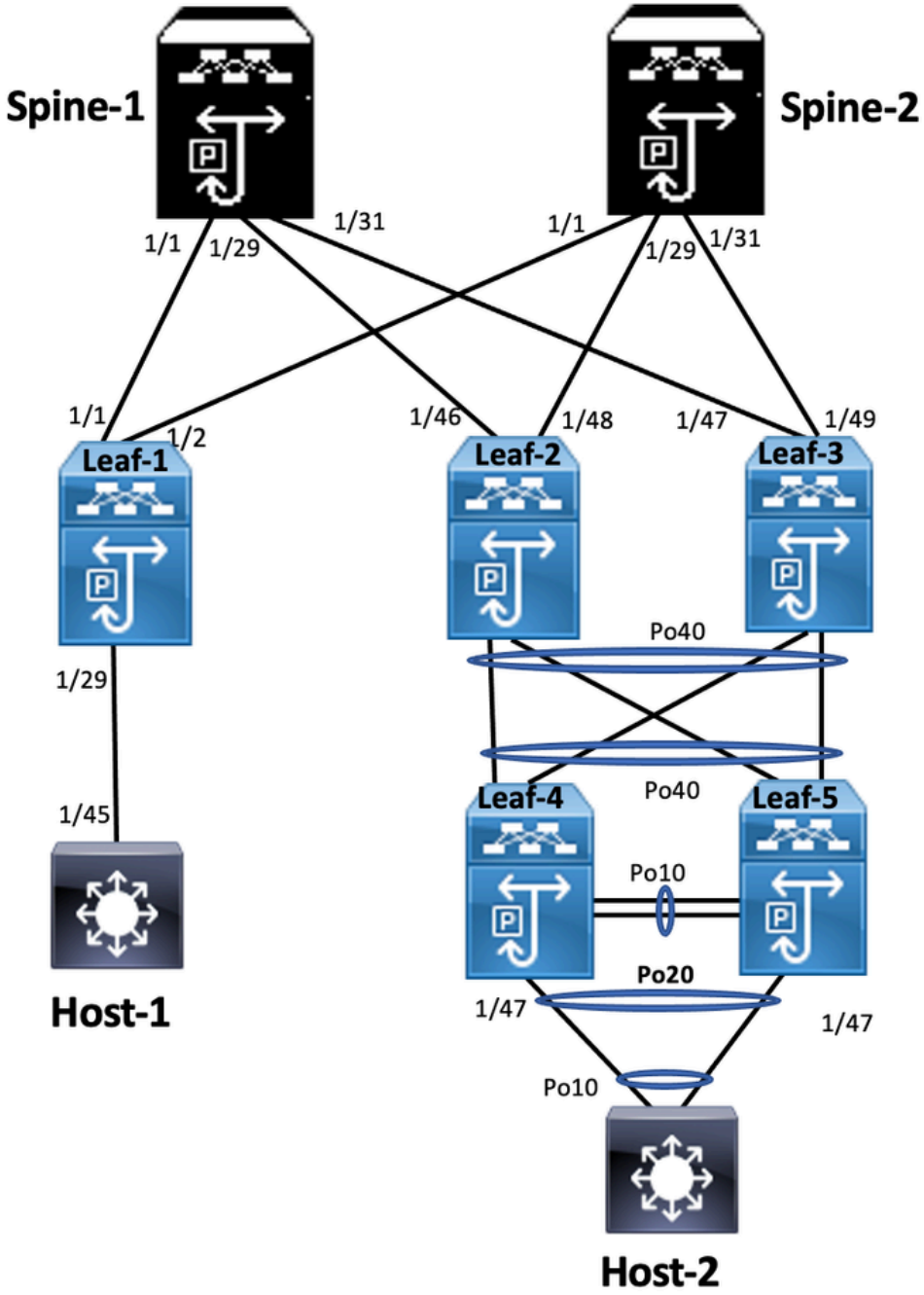
Leaf-5

```
Leaf-5(config-if)# show running-config vpc
feature vpc

vpc domain 2
  peer-keepalive destination 10.201.182.28 source 10.201.182.29
  peer-gateway

interface port-channel10
```

```
  vpc peer-link

interface port-channel20
  vpc 20

interface port-channel40
  vpc 40
```

Configure Double-Sided vPC with vPC Fabric Peering

Network Diagram



In double-sided vPC, both the Nexus 9000 switches run vPC. Each vPC pair of Nexus 9000 switches is connected to the aggregation vPC pair with a unique vPC.

<#root>

Leaf-2

```
Leaf-2(config-if-range)# show run vpc
feature vpc

vpc domain 1
  peer-switch
  peer-keepalive destination 10.201.182.26
  virtual peer-link destination 10.1.1.3 source 10.1.1.4 dscp 56
  peer-gateway
  ip arp synchronize

interface port-channel10
  vpc peer-link

interface port-channel20
  vpc 20

interface port-channel40
  vpc 40
```

Leaf-3

```
Leaf-3(config-if-range)# show run vpc
feature vpc

vpc domain 1
  peer-switch
  peer-keepalive destination 10.201.182.25
  virtual peer-link destination 10.1.1.4 source 10.1.1.3 dscp 56
  peer-gateway
  ip arp synchronize

interface port-channel10
  vpc peer-link

interface port-channel20
  vpc 20

interface port-channel40
  vpc 40
```

Leaf-4 and Leaf-5 configuration is similar as in double-sided vPC.

Troubleshoot

This section provides information you can use in order to troubleshoot your configuration.

Leaf-4(config-if)# show spanning-tree
 	
VLAN0010
  Spanning tree enabled protocol rstp
	Leaf-5(config-if)# show spanning-tree
	
	VLAN0010
	  Spanning tree enabled protocol rstp

```
  Root ID    Priority    32778
             Address     0023.04ee.be01
             Cost        5
             Port        4105 (port-channel10)
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768
sys-id-ext 10)
             Address     0023.04ee.be02
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

Interface        Role Sts Cost      Prio.Nbr
Type
---------------- ---- --- --------- -------- --
------------------------------
Po10             Root FWD 4         128.4105
(vPC peer-link) Network P2p
Po20             Desg FWD 1         128.4115
(vPC) P2p
Po40             Root FWD 1         128.4135
(vPC) P2p


VLAN0020
  Spanning tree enabled protocol rstp
  Root ID    Priority    32788
             Address     0023.04ee.be02
             This bridge is the root
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

  Bridge ID  Priority    32788  (priority 32768
sys-id-ext 20)
             Address     0023.04ee.be02
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec<

Interface        Role Sts Cost      Prio.Nbr
Type
---------------- ---- --- --------- -------- --
------------------------------
Po10             Root FWD 4         128.4105
(vPC peer-link) Network P2p
Po20             Desg FWD 1         128.4115
(vPC) P2p
Po40             Desg FWD 1         128.4135
(vPC) P2p
```

```
  Root ID    Priority    32778
             Address     0023.04ee.be01
             Cost        1
             Port        4135 (port-channel40)
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768
sys-id-ext 10)
             Address     0023.04ee.be02
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

Interface        Role Sts Cost      Prio.Nbr
Type
---------------- ---- --- --------- -------- --
------------------------------
Po10             Desg FWD 4         128.4105
(vPC peer-link) Network P2p
Po20             Desg FWD 1         128.4115
(vPC) P2p
Po40             Root FWD 1         128.4135
(vPC) P2p


VLAN0020
  Spanning tree enabled protocol rstp
  Root ID    Priority    32788
             Address     0023.04ee.be02
             This bridge is the root
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

  Bridge ID  Priority    32788  (priority 32768
sys-id-ext 20)
             Address     0023.04ee.be02
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

Interface        Role Sts Cost      Prio.Nbr
Type
---------------- ---- --- --------- -------- --
------------------------------
Po10             Desg FWD 4         128.4105
(vPC peer-link) Network P2p
Po20             Desg FWD 1         128.4115
(vPC) P2p
Po40             Desg FWD 1         128.4135
(vPC) P2p

Leaf-5(config-if)#
```

```
Leaf-2(config-if-range)# show spanning-tree

VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    32769
             Address     0023.04ee.be01
             Cost        0
```

```
Leaf-3(config-if-range)# show spanning-tree

VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    32778
             Address     0023.04ee.be01
             This bridge is the root
```

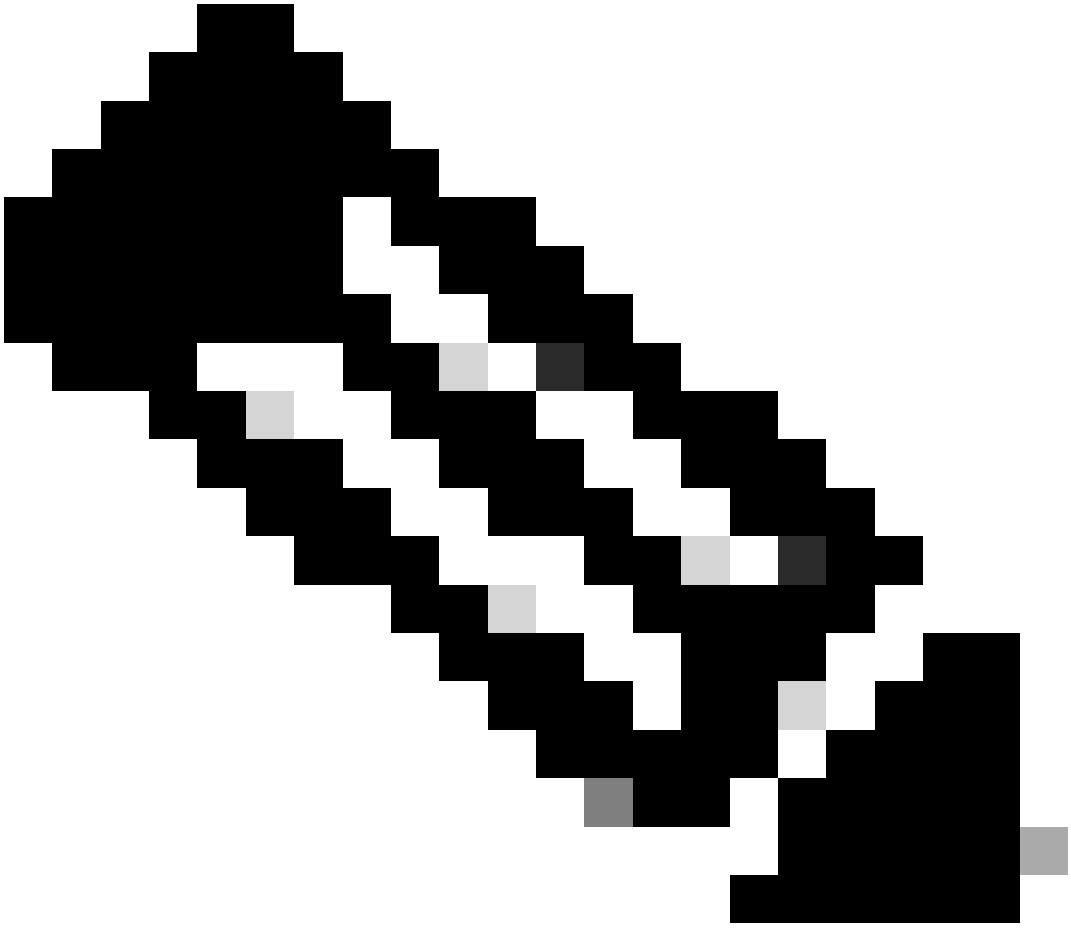
```
            Port        0 ()
            Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768
sys-id-ext 1)
            Address     003a.9c28.2cc7
            Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

Interface        Role Sts Cost      Prio.Nbr
Type
---------------- ---- --- --------- -------- --
------------------------------
Eth1/47          Desg FWD 4         128.185
P2p

VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    32778
             Address     0023.04ee.be01
             This bridge is the root
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768
sys-id-ext 10)
             Address     0023.04ee.be01
             Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

Interface        Role Sts Cost      Prio.Nbr
Type
---------------- ---- --- --------- -------- --
------------------------------
Po10             Desg FWD 4         128.4105
(vPC peer-link) Network P2p
Po40             Desg FWD 1         128.4135
(vPC) P2p
Eth1/47          Desg FWD 4         128.185
P2p

Leaf-2(config-if-range)#
```

```
            Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768
sys-id-ext 10)
            Address     0023.04ee.be01
            Hello Time  2  sec  Max Age 20
sec  Forward Delay 15 sec

Interface        Role Sts Cost      Prio.Nbr
Type
---------------- ---- --- --------- -------- --
------------------------------
Po10             Root FWD 4         128.4105
(vPC peer-link) Network P2p
Po40             Desg FWD 1         128.4135
(vPC) P2p

Leaf-3(config-if-range)#
```

Best Practices for ISSU with vPC

This section describes the best practices for the non-disruptive software upgrade, use Cisco ISSU when a vPC domain is configured. vPC System NX-OS Upgrade (or Downgrade) vPC feature is fully compatible with Cisco ISSU.

In a vPC environment, ISSU is the recommended method to upgrade the system. The vPC system can be independently upgraded with no disruption to traffic. The upgrade is serialized and must be run one at a time. The configuration lock during ISSU prevents synchronous upgrades on both vPC peer devices to happen (configuration is automatically locked on other vPC peer device when ISSU is initiated). To perform ISSU operation, 1 single knob is needed.



Note: vPC with FEX (host vPC) also fully supports ISSU. There is zero packet loss when the upgraded vPC domain has FEX. Server dual-attached to 2 different FEX through a standard port-channel is not aware that the upgrade operation occurs in the network.

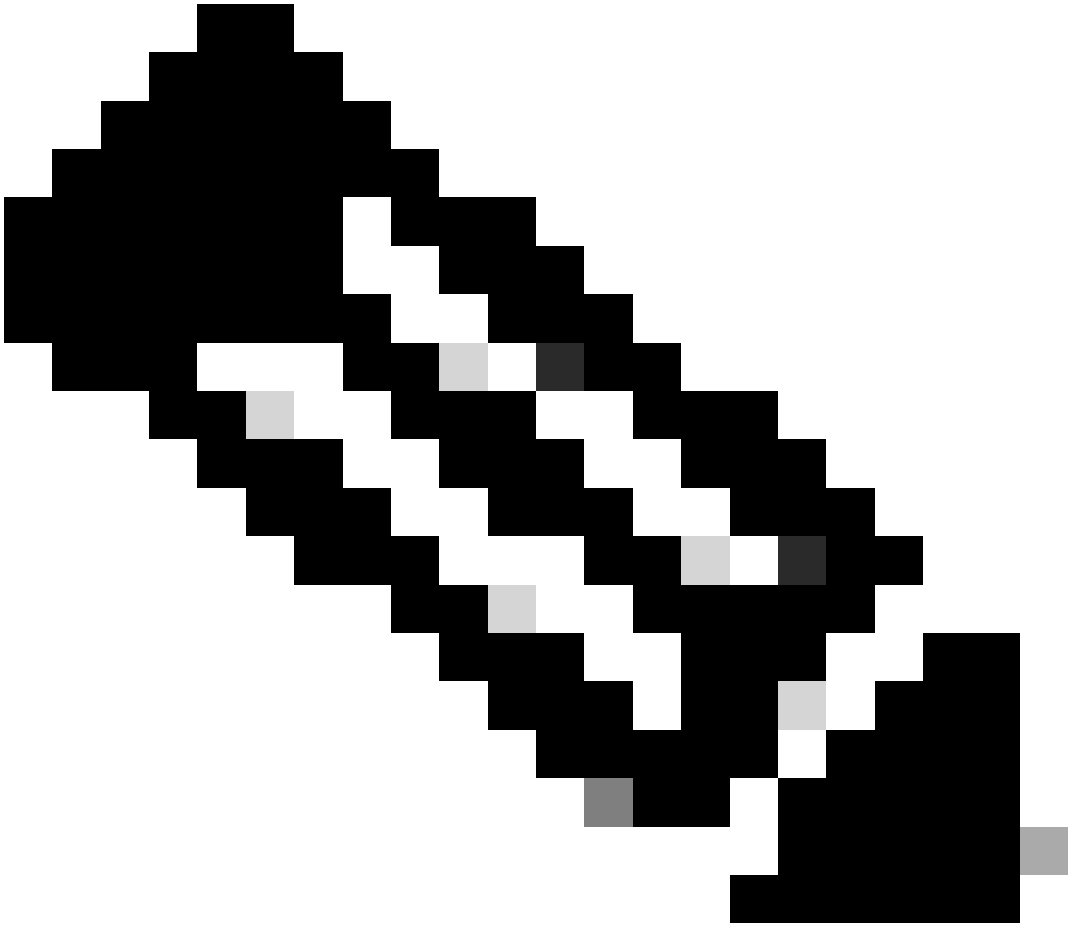
<#root>

```
switch#install all nxos bootflash:<image name>
```

Strong Recommendations

vPC peer device 1, 9K1 (loads the code first on primary or secondary vPC peer device has no importance) use ISSU. Note that other vPC peer device (9K2) has its configuration locked to protect against any operation on the switch.

- Use ISSU (In-Service Software Upgrade) to change NX-OS code release for vPC domain. Perform the operation sequentially, one vPC peer device at a time.
- Refer to NX-OS release notes to select correctly the target NX-OS code release based on device code (ISSU compatibility matrix)



Note: Upgrade 9k1 from 7.x to 9.3.8/9.3.9 caused 40g port down on vPC. If peer-link is connected with 40 G, it is recommended to upgrade both switches into 9.3.8/9.3.9 to bring 40G up or path needs to follow: I7(7) – 9.3(1) – 9.3(9).

Best Practices during vPC Switch Replacement

Pre-Checks

```
show version
show module
show spanning-tree summary
show vlan summary
show ip interface brief
show port-channel summary
show vpc
show vpc brief
show vpc role
show vpc peer-keepalives
```

```
show vpc statistics peer-keepalive
show vpc consistency-parameters global
show vpc consistency-parameters interface port-channel<>
show vpc consistency-parameters vlans
show run vpc all
show hsrp brief
show hsrp
show run hsrp
show hsrp interface vlan <vlan_number>
Show vrrp
Show vrrp brief
Show vrrp interface vlan <vlan_number>
Show run vrrp
```

Steps

1. Shut down all vPC member ports one by one.
2. Shut down all orphan ports.
3. Shut down all Layer 3 physical links one by one.
4. Shut down the vPC Peer Keep Alive (PKA) link.
5. Shut down the vPC Peer-link.
6. Ensure that all the ports are down on the problematic switch.
7. Ensure the traffic is diverted to the Redundant switch via shared commands on the redundant switch.

```
show vpc
show vpc statistics
show ip route vrf all summary
show ip mroute vrf all summary
show ip interface brief
show interface status
show port-channel summary
show hsrp brief
Show vrrp brief
```

8. Ensure the replacement device is set up with the correct image and license.

```
show version
show module
show diagnostic results module all detail
show license
show license usage
show system internal mts buffer summary|detail
show logging logfile
show logging nvram
```

9. Configure the switch with the backup configuration correctly.
10. If auto-recovery is enabled, disable it during replacement.

```
Leaf-2(config)# vpc domain 1
Leaf-2(config-vpc-domain)# no auto-recovery
Leaf-2(config-if)# show vpc bri
Legend:
(*) - local vPC is down, forwarding via vPC peer-link
vPC domain id : 1□
Peer status : peer adjacency formed ok □
vPC keep-alive status : peer is alive □
Configuration consistency status : success
Per-vlan consistency status : success
Type-2 consistency status : success
vPC role : primary
Number of vPCs configured : 1
Peer Gateway : Enabled
Dual-active excluded VLANs : -□Graceful Consistency Check : Enabled□
Auto-recovery status : Disabled□
Delay-restore status : Timer is off. (timeout = 30s)□
Delay-restore SVI status : Timer is off (timeout = 10s)□
Delay-restore Orphan-port status : Timer is off.(timeout = 0s)
Operational Layer3 Peer-router : Disabled
Virtual-peerlink mode : Disabled
```

11. Ensure the Sticky bit is set to False.

```
Leaf-5(config-vpc-domain)# show sys internal vpcm info all | i i stick
OOB Peer Version: 2 OOB peer was alive: TRUE Sticky Master: FALSE
```

12. If the Sticky bit is set to True, reconfigure the vPC role priority. This means to reapply the original configuration for the role priority.
    - vPC domain 1 <== 1 is vPC domain number mentioned on the original switch
    - role priority 2000 <== example: if 2000 is vPC role priority set on original switch
13. Bring up the interfaces strictly in this order:
    1. Bring up the Peer Keep-alive Link.
    2. Bring up the vPC peer-link.
    3. Confirm that the vPC role established correctly.
    4. Bring up rest of the interfaces on the switches one by one in this order:
        1. vPC member ports
        2. Orphan ports (Non-vPC ports)
        3. Layer-3 physical interface

Post Validation Check

```
show version
show module
show diagnostics result module all detail
show environment
show license usage
show interface status
show ip interface brief
show interface status err-disabled
show cdp neighbors
show redundancy status
show spanning-tree summary
```

```
show port-channel summary
show vpc
show vpc brief
show vpc role
show vpc peer-keepalives
show vpc statistics peer-keepalive
show vpc consistency-parameters global
show vpc consistency-parameters interface port-channel1
show vpc consistency-parameters vlans
show hsrp brief
show vrrp brief
```

vPC Considerations for VXLAN Deployment

- On vPC VXLAN, it is recommended to increase the delay restore interface-vlan timer under the vPC configuration, if the number of SVIs are scaled up. For example, if there are 1000 VNIs with 1000 SVIs, it is recommended to increase the delay restore interface-vlan timer to 45 seconds.

  <#root>

  ```
  switch(config-vpc-domain)#

  delay restore interface-vlan 45
  ```

- For vPC, the loopback interface has two IP addresses: the primary IP address and the secondary IP address.
  - The primary IP address is unique and is used by Layer 3 protocols.
  - The secondary IP address on loopback is necessary because the interface NVE uses it for the VTEP IP address. The secondary IP address must be same on both vPC peers.
- NVE Hold-Down timer needs to be higher than vPC delay restore timer.

  ```
  Leaf-2(config-if-range)# show nve interface nve 1 detail
  Interface: nve1, State: Up, encapsulation: VXLAN
  VPC Capability: VPC-VIP-Only [notified]
  Local Router MAC: 003a.9c28.2cc7
  Host Learning Mode: Control-Plane
  Source-Interface: loopback1 (primary: 10.1.1.41.1.4, secondary: 10.1.1.10)
  Source Interface State: Up
  Virtual RMAC Advertisement: Yes
  NVE Flags:
  Interface Handle: 0x49000001
  Source Interface hold-down-time: 180
  Source Interface hold-up-time: 30
  Remaining hold-down time: 0 seconds
  Virtual Router MAC: 0200.1401.010a
  Interface state: nve-intf-add-complete
  Fabric convergence time: 135 seconds
  Fabric convergence time left: 0 seconds
  ```

- For best practices, enable auto-recovery in your vPC environment. Although rare, there is a chance that vPC auto-recovery feature can get you in dual active scenario.

- The vPC Peer-Switch feature allows a pair of vPC peer devices to appear as a single Spanning Tree Protocol root in the Layer 2 topology (they have the same bridge ID). vPC peer-switch must be configured on both vPC peer devices to become operational. The command is:

```
N9K(config-vpc-domain)# peer-switch
```

- vPC Peer-Gateway allows a vPC peer device to act as the active gateway for packets addressed to the other peer device router MAC. It keeps the forwarding of traffic local to the vPC peer device and avoids use of the peer-link. There is no impact on traffic and functionality when it activates the Peer-Gateway capability.

```
N9k-1(config)# vpc domain 1
N9k-1(config-vpc-domain)# peer-gateway
```

- **Layer3 peer-router** command has been introduced which enables routing over the vPC.

```
N9k-1(config)# vpc domain 1
N9k-1(config-vpc-domain)# layer3 peer-router
N9K-1(config-vpc-domain)# exit

N9K-1# sh vpc
Legend:(*)
- local vPC is down, forwarding via vPC peer-link
vPC domain id : 100
Peer status : peer adjacency formed ok
vPC keep-alive status : peer is alive
Configuration consistency status : success
Per-vlan consistency status : success
Type-2 consistency status : success
vPC role : secondary, operational primary
Number of vPCs configured : 2
Peer Gateway : Enabled
Peer gateway excluded VLANs : -
Peer gateway excluded bridge-domains : -
Dual-active excluded VLANs and BDs : -
Graceful Consistency Check : Enabled
Auto-recovery status : Enabled (timeout = 240 seconds)
Operational Layer3 Peer-router : Enabled
```

Strong Recommendations

- Peer-gateway must be enabled before Layer 3 peer-router.
- Both vPC peers must have Layer 3 peer-router configured in order to take effect.
- Enable Supress-arp as a best practice while multicast ip address for VXLAN.
- Use separate loopback ip address for control and dataplane in vPC VXLAN fabric.
- In vPC with MSTP, bridge priority must be the same on both vPC peers.

- For best convergence results, fine tune vPC delay restore and NVE interface holddown timers.

Related Information

- Nexus 9000 Series Switches Documentation
- Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide, Release 9.3(x)
- Cisco Nexus 9000 Series NX-OS Verified Scalability Guide, Release 9.2(1) - includes vPC scalability numbers (CCO)
- Recommended Cisco NX-OS Releases for Cisco Nexus 9000 Series Switches
- Nexus 9000 Series Switches Release Notes
- Cisco Nexus 9000 Series NX-OS VXLAN Configuration Guide, Release 9.2(x) - section on vPC Fabric Peering
- Configure EVPN Vxlan IPV6 Overlay Configuration Example
- Design and Configuration Guide: Best Practices for Virtual Port Channels (vPC) on Cisco Nexus 7000 Series Switches - N7k and N9k vPC theory is similar and this reference covers addition information about best practices
- Configure and Verify Double-sided Virtual vPC